



RAYSTAR

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RFF1020P-1IW-DBS

SPECIFICATION

CUSTOMER:

APPROVED BY	
PCB VERSION	
DATE	

FOR CUSTOMER USE ONLY

SALES BY	APPROVED BY	CHECKED BY	PREPARED BY

Release DATE:

TFT Display Inspection Specification: <https://www.raystar-optronics.com/download/products.htm>

Precaution in use of TFT module: <https://www.raystar-optronics.com/download/declaration.htm>

Revision History

VERSION	DATE	REVISED PAGE NO.	Note
0	2016/01/30		First issue
A	2016/04/06		Modify Block Diagram.
B	2016/08/11		Modify Vibration test
C	2017/01/18		Modify Summary Add Aspect Ratio

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1.Module Classification Information

R	F	F	102	0P	-	1	I	W	-	D	B	S
1	2	3	4	5	-	6	7	8	-	9	10	11

Item	Description	
1	R : Raystar Optonics Inc.	
2	Display Type : F→TFT Type, J→ Custom TFT	
3	Solution: A: 128x160 B:320x234 C:320x240 D:480x234 E:480x272 F:800x480 G:640x480 H:1024x600 I:320x480 J:240x320 K:1280x800 L:240x400 M:1024x768 N:128x128 O:480x800 P:640x320 Q:800x600 S:480x128 T:800x320	
4	Display Size : 10.2" TFT	
5	Version Code.	
6	Model Type: A : TFT LCD E : TFT+FR+CONTROL BOARD J : TFT+FR+A/D BOARD N : TFT+FR+A/D BOARD+CONTROL BOARD S : TFT+FR+POWER BOARD (DC TO DC) 1 : TFT+CONTROL BOARD	6 : TFT+FR H : TFT+D/V BOARD I : TFT+FR+D/V BOARD B : TFT+POWER BD
7	Polarizer Type, Temperature range, View direction	I→Transmissive, W. T, 6:00 ; C→Transmissive, N. T, 6:00 L→Transmissive, W.T,12:00 ; F→Transmissive, N.T,12:00 Y→Transmissive,W.T, IPS TFT ; A→Transmissive, N.T, IPS TFT Z→Transmissive, W.T, O-TFT R→Transmissive, Super W.T, O-TFT N→Transmissive, Super W.T, 6:00; Q→Transmissive, Super W.T, 12:00 V→Transmissive, Super W.T, VA TFT
8	Backlight	W : LED, White H : LED, High Light White F : CCFL, White
9	Driver Method	D: Digital A: Analog L : LVDS M:MIPI
10	Interface	N : without control board A : 8Bit B : 16Bit S:SPI Interface R: RS232 U:USB I: I2C
11	TS	N : Without TS S : resistive touch panel C : capacitive touch panel capacitive touch panel (G-F-F) G : capacitive touch panel(G-G)

2.Summary

TFT 10.2" is a TN transmissive type color active matrix TFT liquid crystal display that use amorphous silicon TFT as switching devices. This module is a composed of a TFT_LCD module. It is usually designed for industrial application and this module follows RoHs.

RAYSTAR OPTRONICS

3.General Specifications

- Size: 10.2 inch
- Dot Matrix: 800 RGB x 480 dots
- Module dimension: 235.0 (H) x145.8 (V) x 13.8 (D) mm
- Active area: 222.0(W) × 132.48(H) mm
- Dot pitch: 0.0925(W) × 0.276(H) mm
- LCD type: TFT, Normally White, Transmissive
- View Direction: 12 o'clock
- Gray Scale Inversion Direction: 6 o'clock
- Aspect Ratio: 16:9
- Backlight Type: LED, Normally White
- Controller IC: RA8875
- Interface: Digital 8080 family MPU 8bit/16bit
- With /Without TP: With RTP
- Surface: Anti-Glare

*Color tone slight changed by temperature and driving voltage.

4.Interface

4.1. LCM PIN Definition (CON2)

Pin	Symbol	Function	Remark
1	GND	System ground pin of the IC . Connect to system ground.	
2	VDD	Power Supply : +3.3V	
3	NC	No connect	
4	RS	Data/Command select	
5	WR	Write strobe signal	
6	RD	Read strobe signal	
7	DB0	Data bus	
8	DB1	Data bus	
9	DB2	Data bus	
10	DB3	Data bus	
11	DB4	Data bus	
12	DB5	Data bus	
13	DB6	Data bus	
14	DB7	Data bus	
15	DB8	Data bus (When select 8bits Mode, this pin is NC)	Note1
16	DB9	Data bus (When select 8bits Mode, this pin is NC)	Note1
17	DB10	Data bus (When select 8bits Mode, this pin is NC)	Note1
18	DB11	Data bus (When select 8bits Mode, this pin is NC)	Note1
19	DB12	Data bus (When select 8bits Mode, this pin is NC)	Note1
20	DB13	Data bus (When select 8bits Mode, this pin is NC)	Note1
21	DB14	Data bus (When select 8bits Mode, this pin is NC)	Note1
22	DB15	Data bus (When select 8bits Mode, this pin is NC)	Note1
23	WAIT	Wait Signal Output(H:active)	
24	NC	No connect	
25	CS	Chip select	
26	RST	Hardware reset	
27	L/R	Left / right selection; Default L/R=H	Note 2,3
28	U/D	Up/down selection; ; Default U/D=L	Note 2,3
29	NC	No connect	
30	NC	No connect	
31	NC	No connect	
32	NC	No connect	
33	VLED-	Power for LED Driver IC(GND)	
34	VLED-	Power for LED Driver IC(GND)	
35	VLED+	Power for LED Driver IC(+5V)	
36	VLED+	Power for LED Driver IC(+5V)	

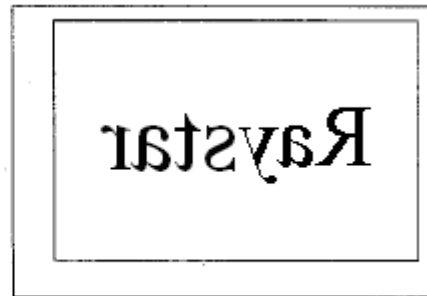
Note1: When select 8bit mode, DB0~DB7 be used, DB8~DB15 no connect
 When select 16bit mode, DB0~DB15 be used

Note 2: Selection of scanning mode

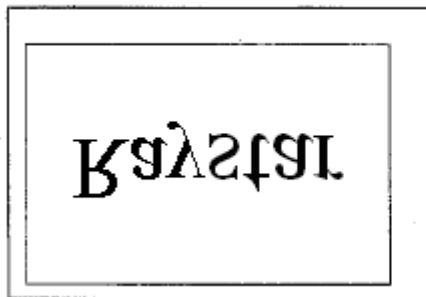
Setting of scan control input		Scanning direction
U/D	L/R	
GND	VDD	Up to down, left to right
VDD	GND	Down to up, right to left
GND	GND	Up to down, right to left
VDD	VDD	Down to up, left to right

Note 3: Definition of scanning direction. Refer to the figure as below:

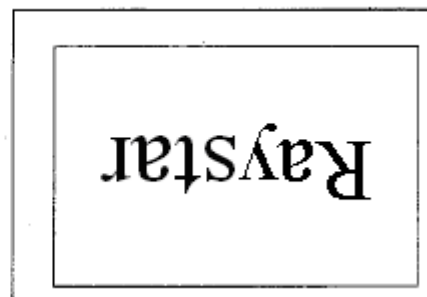

U/D=L, L/R=H



U/D=L, L/R=L

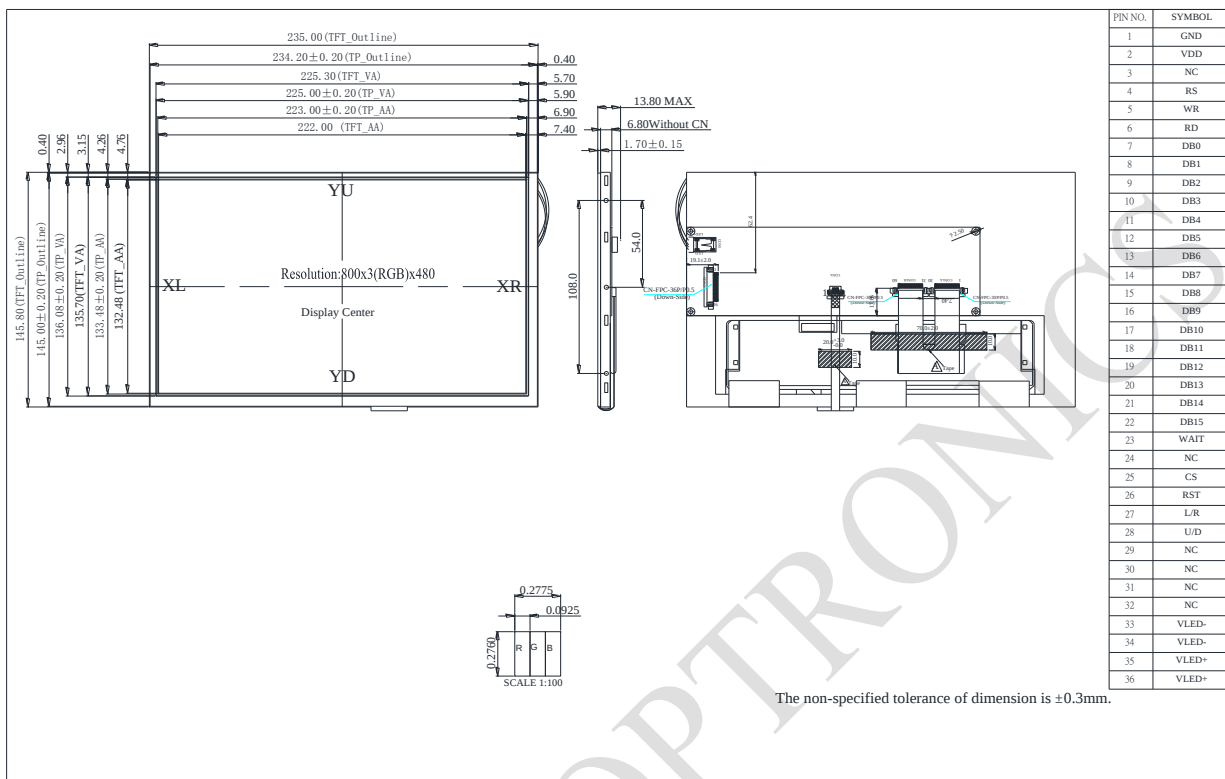


U/D=H, L/R=H

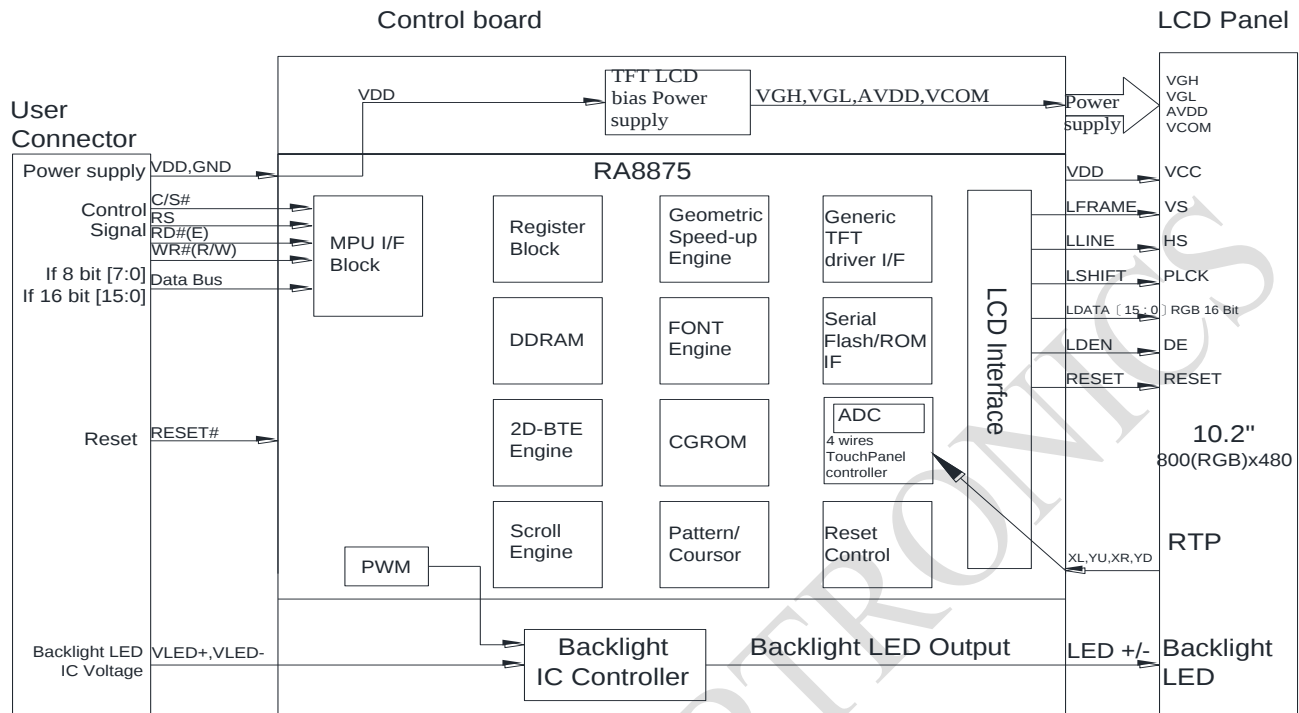


U/D=H, L/R=L

5. Contour Drawing



6. Block Diagram



7. Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	TOP	-20	—	+70	°C
Storage Temperature	TST	-30	—	+80	°C

Note: Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above

- Temp. $\leq 60^{\circ}\text{C}$, 90% RH MAX. Temp. $> 60^{\circ}\text{C}$, Absolute humidity shall be less than 90% RH at 60°C

8. Electrical Characteristics

8.1. Operating conditions: (CON2.Pin1=GND, Pin2=VDD)

Item	Symbol	Condition	Min	Typ	Max	Unit	Remark
Supply Voltage For LCM	VDD	—	3.0	3.3	3.6	V	—
Supply Current For LCM	IDD	—	—	190	195	mA	Note1

Note 1 : This value is test for VDD=3.3V , Ta=25℃ only

8.2. Backlight driving conditions (CON2.Pin33,34=VLED-, Pin35,36=VLED+)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Operation Current For LED Driver	VLED=5V	500	—	750	mA	Note 1,2
Power Consumption	VLED=5V	2500	—	3750	mW	Note 1,2
Supply Voltage For LED Driver	VLED+	—	5	—	V	—
LED Life Time	—	20,000	—	—	Hr	Note 2,3,4

Note 1 : Base on VLED= 5V for the back light driver IC specification

Note 2 : Ta = 25 ℃

Note 3 : Brightness to be decreased to 50% of the initial value

Note 4 : The single LED lamp case

9.DC CHARATERISTICS

Parameter	Symbol	Rating			Unit	Condition
		Min	Typ	Max		
Low level input voltage	VIL	GND	-	0.2 VDD	V	
High level input voltage	VIH	0.8 VDD	-	VDD	V	

10. Interface timing

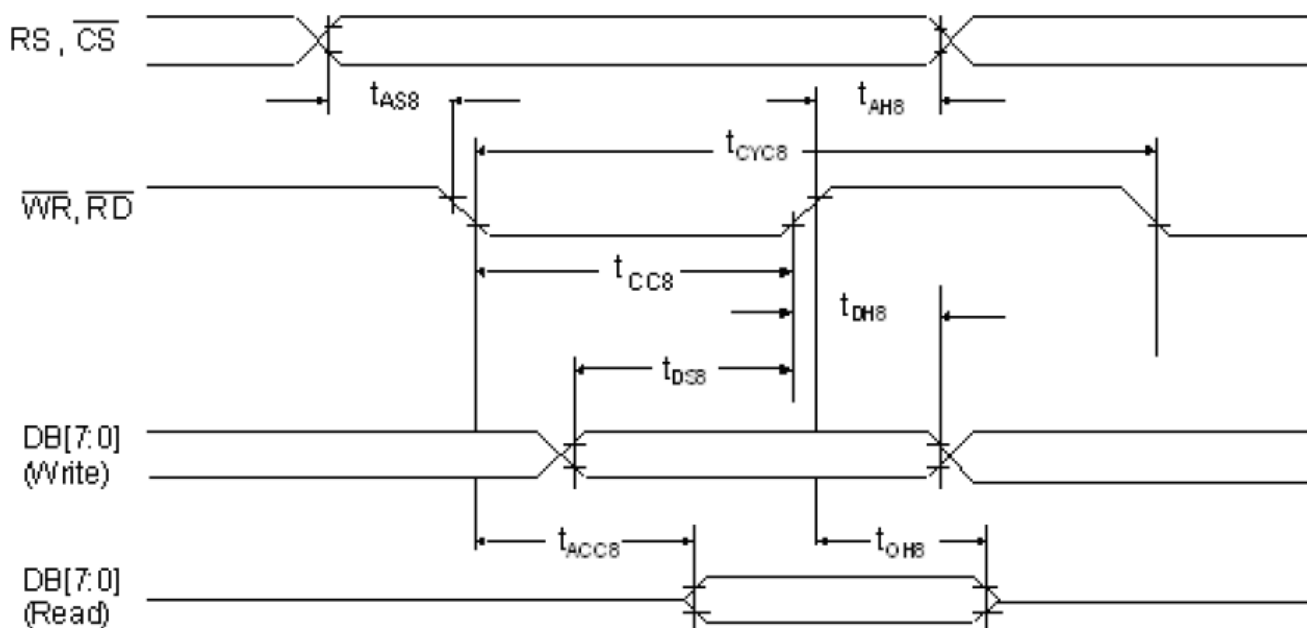
10.1. 8080 Mode

The following timing charts are used to describe the timing specification of the standard 8080 interfaces.

10.2. 8080 Mode Write Cycle

Symbol	Parameter	Rating		Unit	Symbol
		Min.	Max.		
tCYC8	Cycle time	50	-	ns	tc is one system clock period: tc = 1/SYS_CLK
tCC8	Strobe Pulse width	20	-	ns	
tAS8	Address setup time	0	-	ns	
tAH8	Address hold time	10	-	ns	
tDS8	Data setup time	20	-	ns	
tDH8	Data hold time	10	-	ns	
tACC8	Data output access time	0	20	ns	
tOH8	Data output hold time	0	20	ns	

10.3. 8080 – 8/16-bit interface



The data bus width of RA8875 can be selected to 8-bit/16-bit by setting the Bit [1:0] of SYSR. When Bit [1:0] of SYSR is cleared to "00", then the data bus is 8-bit. If Bit [1:0] of SYSR is set to "11", then the data transition is set as 16-bit.

10.4. Pixel Data Format

16-bit mode color

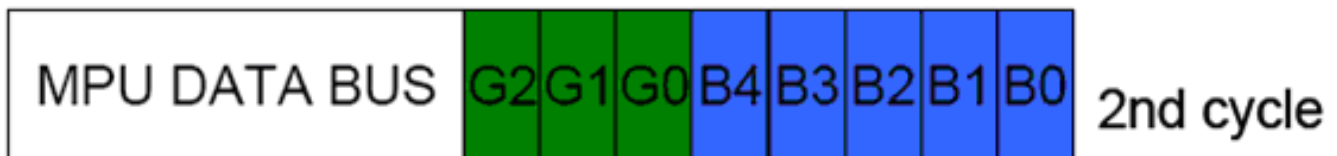


65K colors 16-bit



256 colors 16-bit

8-bit mode color



65K colors 8-bit



256 colors 8-bit

11. Optical Characteristics

TFT LCD characteristic

Item		Symbol	Condition.	Min	Typ.	Max.	Unit	Remark
Response time		Tr	$\theta=0^{\circ}$ 、 $\Phi=0^{\circ}$	-	15	30	ms	Note 3,5
		Tf		-	20	40	ms	
Contrast ratio		CR	At optimized viewing angle	250	300	-	-	Note 4,5
Color Chromaticity	White	Wx	$\theta=0^{\circ}$ 、 $\Phi=0$	0.26	0.31	0.36	-	Note 2,6,7
		Wy		0.28	0.33	0.38	-	-
Viewing angle (Gray Scale Inversion Direction)	Hor.	Θ_R	$CR \geq 10$	55	65	-	Deg.	Note 1
		Θ_L		55	65	-		
	Ver.	Φ_T		35	45	-		
		Φ_B		55	65	-		
Brightness		-	-	200	250	-	cd/m ²	Center of display

Ta=25±2℃,

Note 1: Definition of viewing angle range

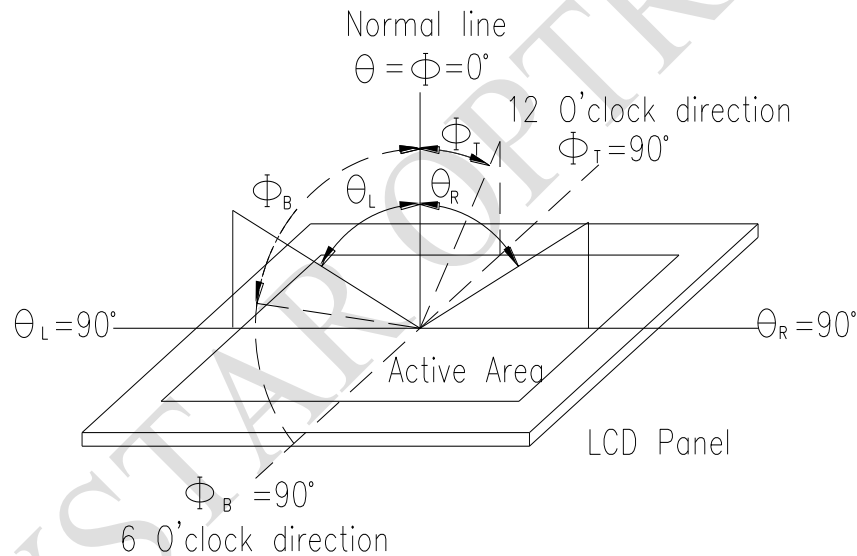


Fig.11.1. Definition of viewing angle

Note 2: Test equipment setup:

After stabilizing and leaving the panel alone at a driven temperature for 10 minutes, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7 or BM-5 luminance meter 1.0° field of view at a distance of 50cm and normal direction.

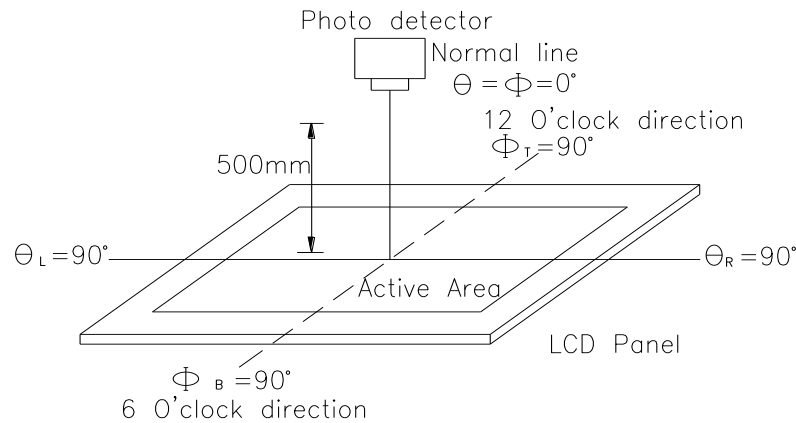
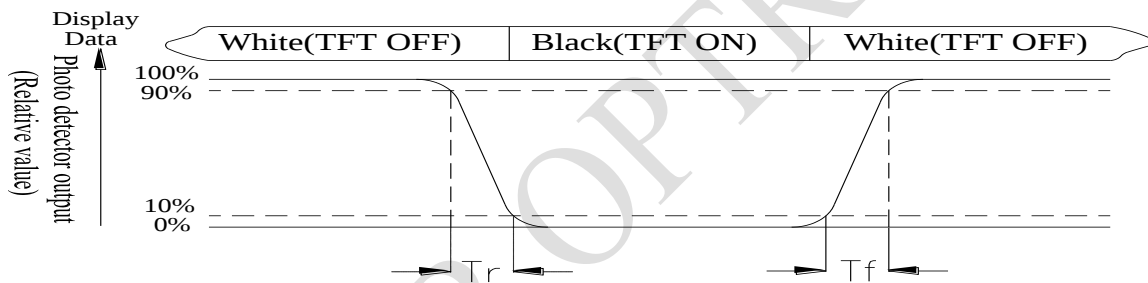


Fig. 11.2. Optical measurement system setup

Note 3: Definition of Response time:

The response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time, T_r , is the time between photo detector output intensity changed from 90% to 10%. And fall time, T_f , is the time between photo detector output intensity changed from 10% to 90%



Note 4: Definition of contrast ratio:

The contrast ratio is defined as the following expression.

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

Note 5: White $V_i = V_{i50} \pm 1.5V$

Black $V_i = V_{i50} \pm 2.0V$

" $\pm$ " means that the analog input signal swings in phase with VCOM signal.

" $\pm$ " means that the analog input signal swings out of phase with VCOM signal.

The 100% transmission is defined as the transmission of LCD panel when all the input terminals of module are electrically opened.

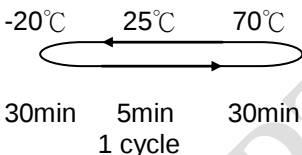
Note 6: Definition of color chromaticity (CIE 1931)

Color coordinates measured at the center point of LCD

Note 7: Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

12. Reliability

Content of Reliability Test (Wide temperature, -20°C~70°C)

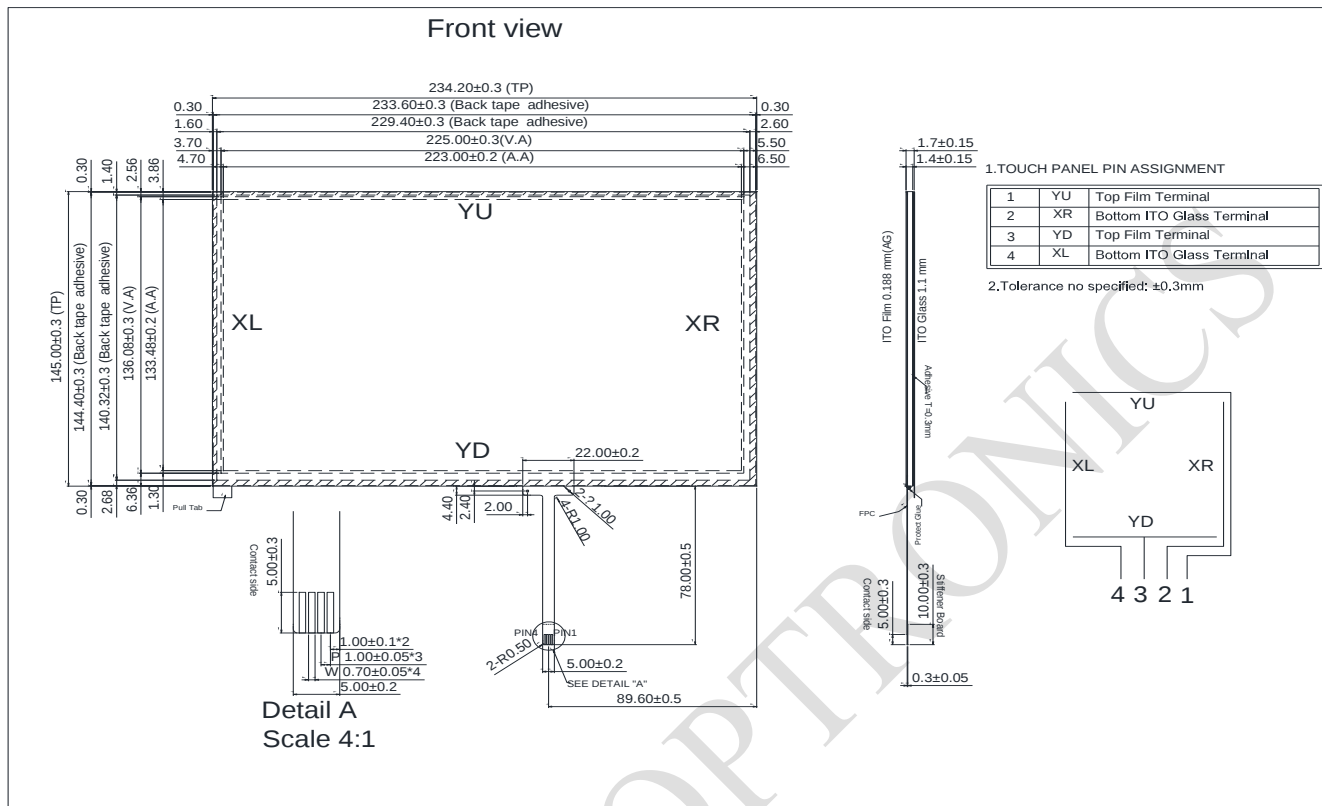
Environmental Test			
Test Item	Content of Test	Test Condition	Note
High Temperature storage	Endurance test applying the high storage temperature for a long time.	80°C 200hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30°C 200hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	70°C 200hrs	—
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-20°C 200hrs	1
High Temperature/ Humidity Operation	The module should be allowed to stand at 60°C,90%RH max	60°C,90%RH 96hrs	1,2
Thermal shock resistance	The sample should be allowed stand the following 10 cycles of operation 	-20°C/70°C 10 cycles	—
Vibration test	Endurance test applying the vibration during transportation and using.	Total fixed amplitude : 3 1.5mm Vibration Frequency : 10~55Hz One cycle 60 seconds to 3 directions of X,Y,Z for Each 15 minutes	3
Static electricity test	Endurance test applying the electric stress to the terminal.	VS=±600V(contact) ,±800v(air), RS=330Ω CS=150pF 10 times	—

Note1: No dew condensation to be observed.

Note2: The function test shall be conducted after 4 hours storage at the normal Temperature and humidity after remove from the test chamber.

Note3: The packing have to including into the vibration testing.

13.Touch Panel Information



13.1. Resistance Touch Panel General Specifications

Item	Description
Driving condition	DC5V
Operating force	50~120g
Linearity max	$\leq \pm 1.5\%$
Insulating resistance	$> 20M\Omega$, 25V(DC)
Light transparence	70%
Structure type	ITO Film/ITO Glass(F/G)
Surface Hardness	3H typ
Pen Hitting Durability (with the silicon rubber)	$> 1000,000$ times
X resistance	350~1100 Ω
Y resistance	100~750 Ω

14.Initial Code For Reference

```
void Initial_RA8875()
```

```
{  
    RES = 1;  
    Delay1ms (10);  
    RES = 0;        //Active low  
    Delay1ms (50);  
    RES = 1;  
    Delay1ms (100);  
  
    LCD_CmdWrite(0x88);  
    LCD_DataWrite(0x0c);  
    Delay1ms(1);  
    LCD_CmdWrite(0x89);  
    LCD_DataWrite(0x02);  
    Delay1ms(1);  
  
    LCD_CmdWrite(0x10);  
    LCD_DataWrite(0x0c);  
    LCD_CmdWrite(0x04);  
    LCD_DataWrite(0x81);  
    Delay1ms(1);  
  
    //Horizontal set  
    LCD_CmdWrite(0x14);  
    LCD_DataWrite(0x63);  
    LCD_CmdWrite(0x15);  
    LCD_DataWrite(0x00);  
    LCD_CmdWrite(0x16);  
    LCD_DataWrite(0x03);  
    LCD_CmdWrite(0x17);  
    LCD_DataWrite(0x03);  
    LCD_CmdWrite(0x18);  
    LCD_DataWrite(0x0B);  
    LCD_CmdWrite(0x19);  
    LCD_DataWrite(0xdf);  
    LCD_CmdWrite(0x1a);  
    LCD_DataWrite(0x01);  
    LCD_CmdWrite(0x1b);  
    LCD_DataWrite(0x20);  
    LCD_CmdWrite(0x1c);  
    LCD_DataWrite(0x00);  
    LCD_CmdWrite(0x1d);  
    LCD_DataWrite(0x16);  
    LCD_CmdWrite(0x1e);  
    LCD_DataWrite(0x00);  
    LCD_CmdWrite(0x1f);  
    LCD_DataWrite(0x01);  
}
```

//setting active window X

```
LCD_CmdWrite(0x30);  
LCD_DataWrite(0x00);  
LCD_CmdWrite(0x31);  
LCD_DataWrite(0x00);  
LCD_CmdWrite(0x34);  
LCD_DataWrite(0x1F);  
LCD_CmdWrite(0x35);  
LCD_DataWrite(0x03);
```

//setting active window Y

```
LCD_CmdWrite(0x32);  
LCD_DataWrite(0x00);  
LCD_CmdWrite(0x33);  
LCD_DataWrite(0x00);  
LCD_CmdWrite(0x36);  
LCD_DataWrite(0xdf);  
LCD_CmdWrite(0x37);  
LCD_DataWrite(0x01);  
}
```

LCM Sample Estimate Feedback Sheet		
Module Number : _____		
1 、 <u>Panel Specification</u> :		
1. Panel Type :	☐ Pass	☐ NG , _____
2. View Direction :	☐ Pass	☐ NG , _____
3. Numbers of Dots :	☐ Pass	☐ NG , _____
4. View Area :	☐ Pass	☐ NG , _____
5. Active Area :	☐ Pass	☐ NG , _____
6. Operating Temperature :	☐ Pass	☐ NG , _____
7. Storage Temperature :	☐ Pass	☐ NG , _____
8. Others : _____		
2 、 <u>Mechanical Specification</u> :		
1. PCB Size :	☐ Pass	☐ NG , _____
2. Frame Size :	☐ Pass	☐ NG , _____
3. Material of Frame :	☐ Pass	☐ NG , _____
4. Connector Position :	☐ Pass	☐ NG , _____
5. Fix Hole Position :	☐ Pass	☐ NG , _____
6. Backlight Position :	☐ Pass	☐ NG , _____
7. Thickness of PCB :	☐ Pass	☐ NG , _____
8. Height of Frame to PCB :	☐ Pass	☐ NG , _____
9. Height of Module :	☐ Pass	☐ NG , _____
10. Others :	☐ Pass	☐ NG , _____
3 、 <u>Relative Hole Size</u> :		
1. Pitch of Connector :	☐ Pass	☐ NG , _____
2. Hole size of Connector :	☐ Pass	☐ NG , _____
3. Mounting Hole size :	☐ Pass	☐ NG , _____
4. Mounting Hole Type :	☐ Pass	☐ NG , _____
5. Others :	☐ Pass	☐ NG , _____
4 、 <u>Backlight Specification</u> :		
1. B/L Type :	☐ Pass	☐ NG , _____
2. B/L Color :	☐ Pass	☐ NG , _____
3. B/L Driving Voltage (Reference for LED Type) : ☐ Pass ☐ NG , _____		
4. B/L Driving Current :	☐ Pass	☐ NG , _____
5. Brightness of B/L :	☐ Pass	☐ NG , _____
6. B/L Solder Method :	☐ Pass	☐ NG , _____
7. Others :	☐ Pass	☐ NG , _____

>> Go to page 2 <<

Module Number : _____

5 、 Electronic Characteristics of Module :

1.Input Voltage :	☐ Pass	☐ NG , _____
2.Supply Current :	☐ Pass	☐ NG , _____
3.Driving Voltage for LCD :	☐ Pass	☐ NG , _____
4.Contrast for LCD :	☐ Pass	☐ NG , _____
5.B/L Driving Method :	☐ Pass	☐ NG , _____
6.Negative Voltage Output :	☐ Pass	☐ NG , _____
7.Interface Function :	☐ Pass	☐ NG , _____
8.LCD Uniformity :	☐ Pass	☐ NG , _____
9.ESD test :	☐ Pass	☐ NG , _____
10.Others :	☐ Pass	☐ NG , _____

6 、 Summary :
Sales signature : _____

Customer Signature : _____

Date : / /